Eastern IFCA

Inshore Fisheries and Conservation Authority

RESEARCH REPORT

2015

HORSESHOE POINT COCKLE STOCK ASSESSMENT

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HORSESHOE POINT COCKLE SURVEY

CONTENTS

Introduction

When the old Sea Fisheries Committees transformed into the Inshore Fisheries and Conservation Authorities on April 1st 2011, Eastern IFCA gained a small section of the Lincolnshire coast that had formally been under the jurisdiction of North Eastern Sea Fisheries Committee. This area, incorporating the coast between the Donna Nook bombing range and Haile Sand fort included a small cockle bed at Horseshoe Point. For survey and reporting purposes, this bed has been divided into three component beds named Horseshoe Point, Grainthorpe Haven West and Grainthorpe Haven East. Figure 1 shows the location of these beds.

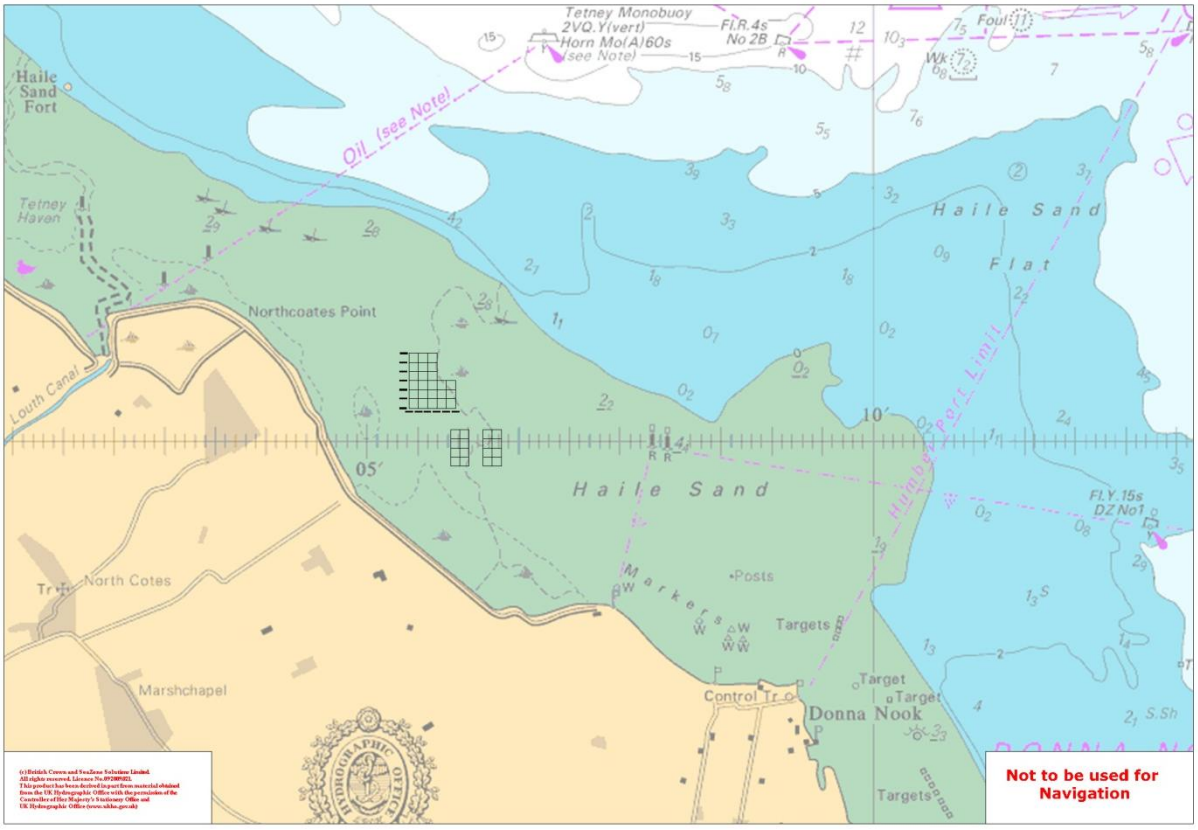

Figure 1 – Chart showing the location of the Horseshoe Point cockle beds on Haile Sand

Historically these beds have supported small but valuable fisheries, attracting fishers from Boston and King's Lynn in addition to local hand-gatherers. On occasions, transient fishers have also exploited the stocks from further afield, some travelling from as far away as Wales and the west coast. Annual landings from this fishery have sometimes exceeded 700 tonnes, but like many cockle beds, the stocks in the area are by no means consistent (MacDonald, 2008).

Management of these beds is conducted under NESFC Byelaw XXIV (Humber Estuary Cockle Fishery Byelaw), which was adopted by EIFCA in 2011 during the transition from

ESFJC. This byelaw restricts cockle fishing on these beds to hand gathering (using rakes with a maximum head width of 305mm and a minimum of 20mm between the teeth). Fishers are only allowed to harvest 5 kg of cockles per day unless they have a permit. Permit holders are allowed to fish 500 kg of cockle per day. In order to protect breeding stock and newly settled juveniles, the beds are totally closed under the byelaw between 1st May and 31st August inclusive. There is also a minimum landing size (MLS) imposed on this bed, in which cockles are prohibited from being harvested if they can pass through a 20mm square grid (this equates approximately to a MLS of 16mm width). Due to low adult stock levels the beds have remained closed since 2002, but there are anecdotal reports suggesting a low level of poaching has occurred on occasions since then.

In 1996 NESFC commenced bi-annual surveys to estimate the weight of commercially sized stock within the beds. In 2000 it was estimated that there were over 400 tonnes of commercially available cockles within the Horseshoe Point beds but by 2001 these levels had declined to around 200 tonnes and by 2003 to 60-90 tonnes (NESFC, 2004). The NESFC bi-annual surveys suggested that in spring 2004 the commercially viable stock within the beds had dropped to just 9 tonnes, equivalent to 8 cockles m^{-2}, but in autumn 2004 a commercially viable stock of 226 tonnes (160 cockles $m^{-2)}$ was recorded. The discrepancy in these figures was put down to a change in survey method and the ephemeral nature of the bed rather than a dramatic increase in stock. By the autumn of the following year the stocks had declined back to 85 tonnes and to 51 tonnes by the autumn of 2006 (NESFC 2005 & 2006).

In preparation for taking over the site, an ESFJC research officer conducted a site visit to the beds in 2010 with the NESFC environment officer. Although the stocks had recovered to approximately 400 tonnes, it was apparent during this visit that the stocks were suffering from a similar condition to that which had been killing adult cockles in the Wash since 2008. Moribund cockles were witnessed to be gaping on the surface of the sand amid large numbers of shells from cockles that had recently died (Jessop, *pers com*) To date, EIFCA research staff have conducted seven surveys on these beds since 2011 (January and August 2011, January 2012, February and August 2013, August 2014 and July 2015). Results of the earlier surveys can be found in Jessop et al 2011, Jessop et al 2012 and Stringer 2014, while the July 2015 survey is reported here. These surveys found there had been good spatfalls in 2010, 2011 and 2012, but the majority of these cockles were dying during the following summer before reaching the minimum landing size. Between 2011 and 2013 the stocks ranged between a total of 12 tonnes (February 2013) and 105 tonnes (August 2011), but very few of these were attaining MLS. The survey conducted in August 2013 found there had been a further good settlement. The

following survey, conducted in August 2014, found these cockles had grown slightly slower than was usual for this site, but they had survived the summer. Although only 18 tonnes were estimated to have attained the MLS of 16mm width, a further 200 tonnes of the 928 tonnes estimated to be present had attained 14mm width It was felt that given a few months of additional growth, these cockles would be of harvestable size. Plans were put forward, therefore, to open the beds in March 2015.

There were a number of challenges that needed to be overcome, however, before the beds could be commercially fished. Shellfish can only be commercially harvested from areas in which the Food Standards Agency (FSA) has classified the water as being hygienically safe. Maintaining this classification requires regular monthly sampling. Unfortunately, due to the low stock levels, this sampling had ceased in 2004. In 2011 EIFCA had approached the relevant authority, East Lindsey District Council, to recommence sampling, but stock levels had been too low at that time to find sufficient sample material. With little prospect of further fisheries due to the high annual die-offs, no further attempts had been made to reinstate an expensive sampling regime. Following the survey in August 2014, East Lindsey District Council was requested to recommence sampling. In order to gain a preliminary classification for this area, ten shellfish samples would need to be collected, no less than one week apart. A Sanitary Survey would also need to be conducted by CEFAS, and additional bio-toxin monitoring would also be required. Initially it had been hoped that samples could be collected weekly from September onwards, allowing a classification to be in place before the end of the year. Unfortunately, delays meant it was not possible to commence sampling until November. The shorter daylight hours during winter also prevented access to the beds during the neap tide low water periods, limiting sampling to once a fortnight. Due to these delays the initial sampling regime could not be completed until April, when the beds were eventually given a Class A water classification. (For sampling results see the CEFAS national microbiological monitoring results at: https://www.cefas.co.uk/publications-data/food-safety/classification-and-microbiological-monitoring/england-and-wales-classification-and-monitoring/shellfish-monitoring-results/details/?species=COC&connection=SHS&PointID=B067J).

This left only a very short window in which the beds could be harvested before the closed season began in May. Regaining water classification status for the site was not the only obstacle encountered when attempting to open this fishery, however. The site is within a Marine Protected Area, part of which is prohibited to fishing in order to protect eelgrass (*Zostera spp*) beds (see figure 2). The area prohibited to fishing includes the whole West Grainthorpe Haven bed, half of the East Grainthorpe bed and a small part of the Horseshoe Point bed.

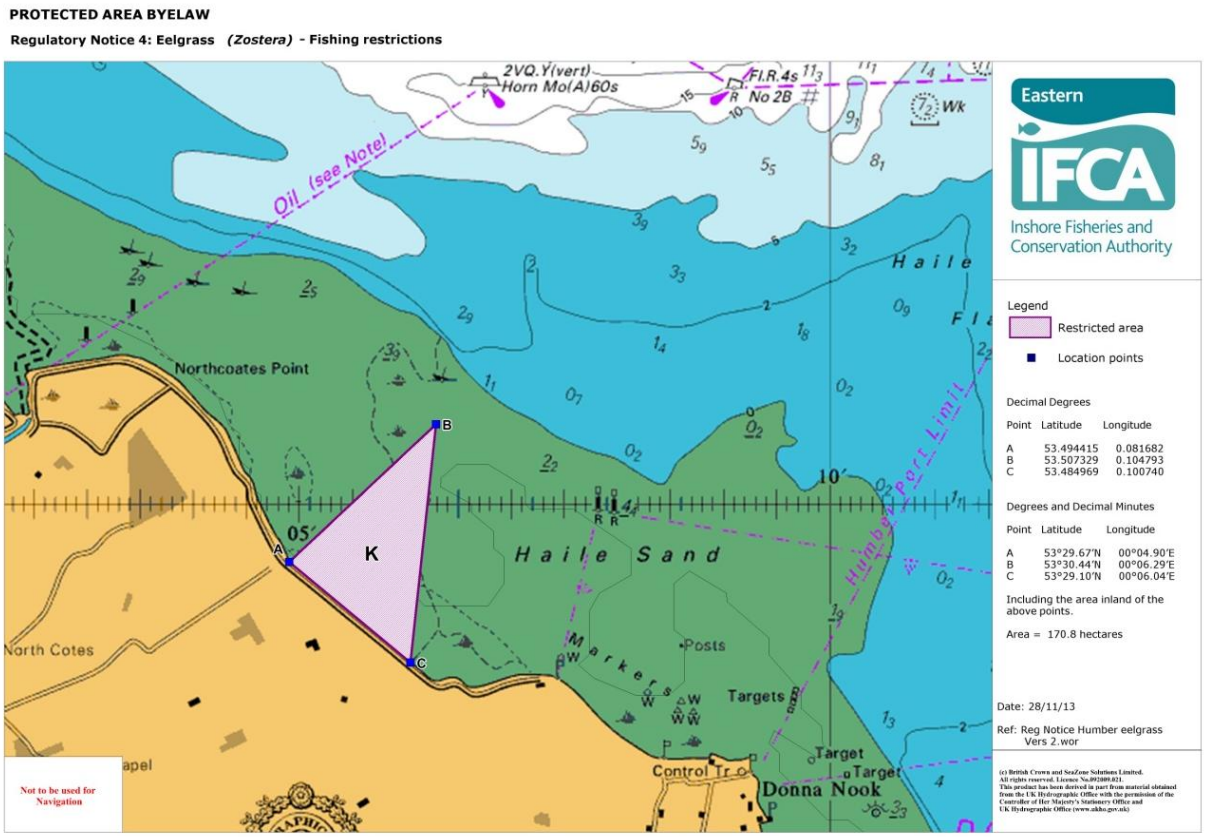

Figure 2 - Chart showing the location of the restricted fishery area at Horseshoe Point, to protect eelgrass (Zostera) beds.

Access to this site has traditionally been from shore, generally using off-road vehicles. Consultation with Natural England raised concerns about the adverse impacts this access could have, both to the marsh itself and disturbance to nesting birds. During liaison with members of the fishing industry and Natural England, a number of routes were considered as potential options for accessing the cockle beds. The favoured route, using an existing track that runs north-west from the Horseshoe Point car park, around the marsh, was found to cross land owned by a local Wildfowl Group. An option of laying a temporary metallic road across the marsh, thus avoiding the land owned by the Wildfowl Group was explored. During consultation, however, it was found that the car park and the marshes leading to the cockle beds were leased by a local landowner. At a site visit on May 19th, EIFCA staff met with the landowner and relevant stakeholders from the fishing industry, Natural England and East Lindsey District Council. During this meeting all parties agreed there was potential to access the site using a metallic road over the marsh, but the legalities of doing so were complex due to issues of third-party liabilities. To date, discussions are still on-going between fishing industry representatives and the landowner regarding financial recompense and liabilities. The opening of the Wash cockle fishery in June alleviated the immediate pressure to open these beds, but workable

solutions still need to be agreed and implemented before this or future fisheries can be opened.

At the beginning of June, staff from East Lindsey District Council responsible for collecting the water classification samples alerted EIFCA that large numbers of dead shell were appearing on the cockle beds. A site visit by EIFCA staff on June 4th 2015 found large numbers of cockles were either dying or had recently died, with symptoms similar to those observed in the Wash during atypical mortality events. Samples collected at one site found 0.3% of the cockles were moribund. Although this number is relatively low, a study conducted in 2012 in the Wash on atypical cockle mortality found the proportion of moribund cockles was a reasonable proxy for determining daily mortality rates (Jessop et al, 2012). This study had also found mortality rates had a strong correlation with rises in temperature. It could be expected, therefore, that as temperatures increased over summer, this rate of mortality would also increase.

A further survey was conducted on the Horseshoe Point beds on 30th July 2015. The results from this survey are discussed below.

Method

The survey was conducted on foot over the low water period on July 30th 2015. Although previous summer surveys conducted by EIFCA on these beds have been conducted in August, they have generally occurred at the beginning of the month, so the timing of this survey is only a week or two earlier than usual. The method used for this survey was also consistent with that used during previous surveys.

The survey was conducted by taking samples from a predetermined regular grid of sample stations that were approximately 100 metres apart. The positions of these stations are consistent with those used during previous surveys in 2013 and 2014. The Horseshoe Point bed consisted of 36 sampling stations, while Grainthorpe Haven beds each consisted of 15 stations. Figures 3 and 4 show the positions of the stations on these beds. Hand-held GPS units were used to locate the position of the stations in the field.

Samples were collected by sieving the sediment taken from 0.1m^2 quadrates. All cockles found in the samples were washed and retained in waterproof bags, one bag per station. Each sample was labelled with the bed name and station number written on waterproof paper.

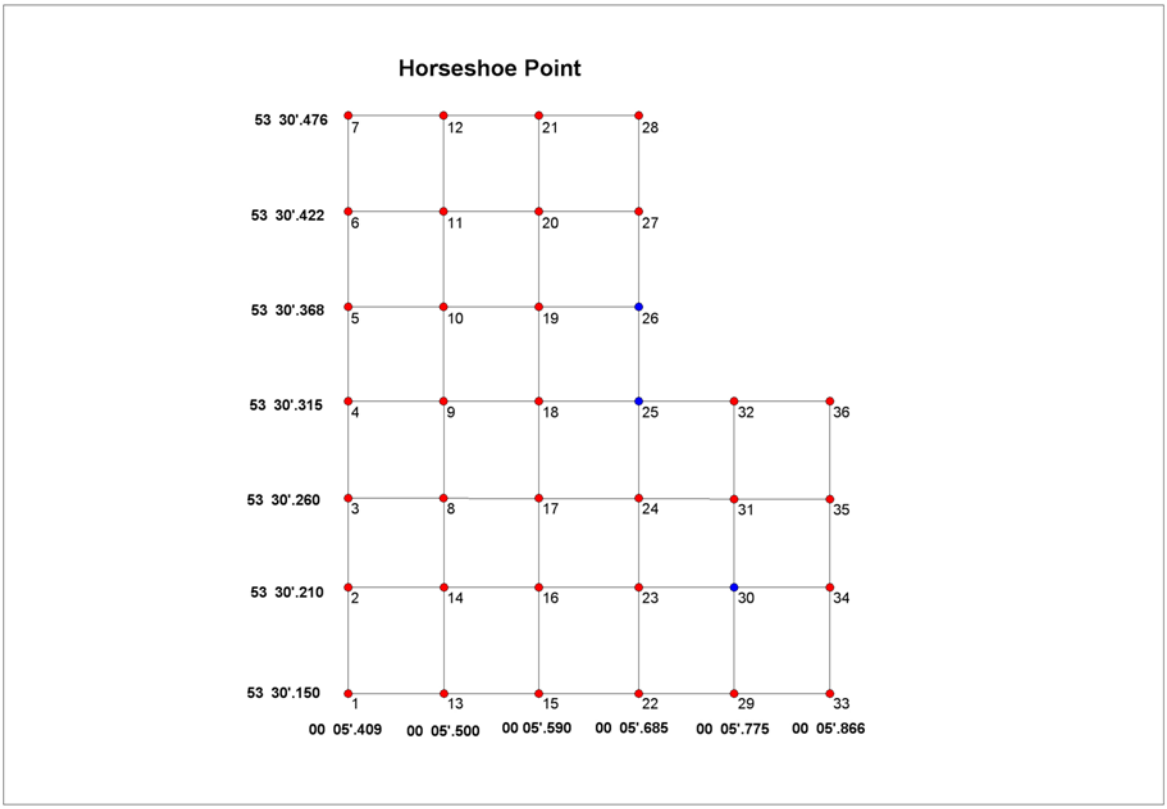

Figure 3 – Positions and station numbers of the sample stations on the Horseshoe Point bed.

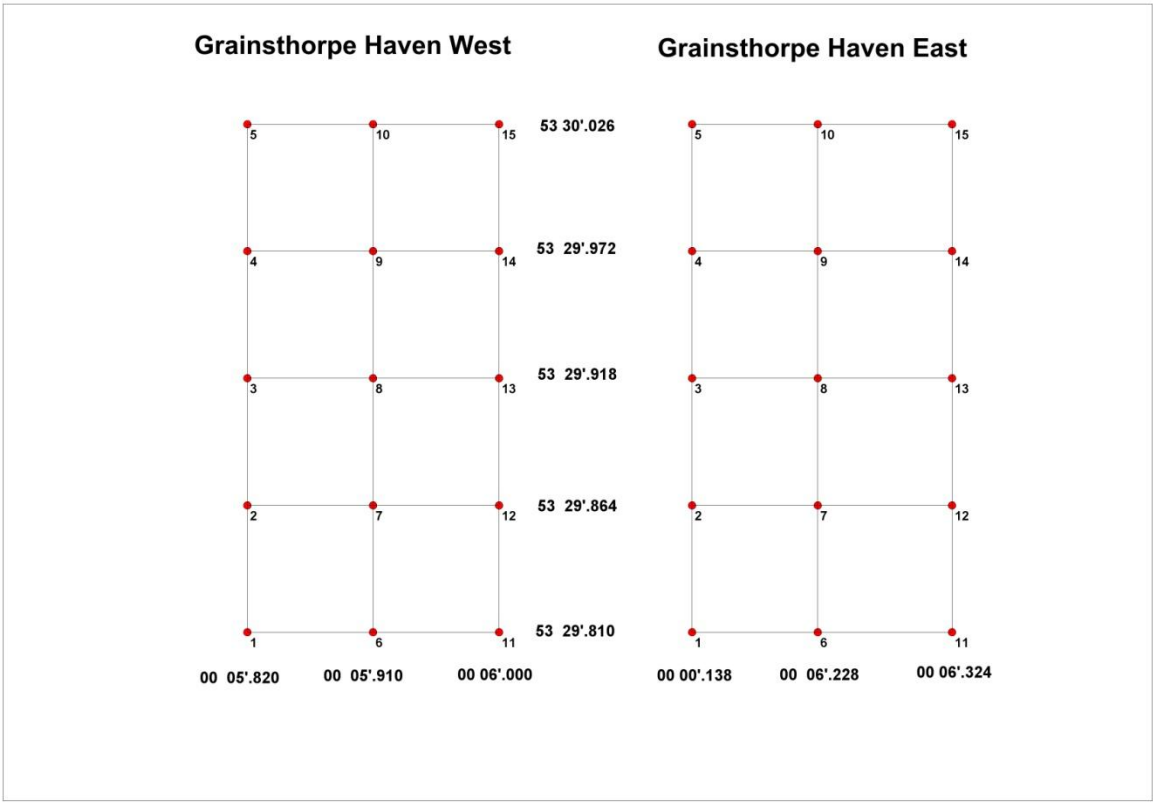

Figure 4 – Positions and station numbers of the sample stations on the Grainthorpe Haven beds.

Additional environmental data were recorded at each station, including the type of sediment present, the number of lugworm, *Arenicola marina,* casts present in the quadrate, the presence or absence of sand mason worms, *Lanice conchilega,* and the number of Baltic tellins, *Macoma balthica,* that were present in the sample.

Once ashore the retained cockles were measured by length and width to the nearest 1mm. These were divided into year-class groups that were further sub-divided into two size groups of ≥16mm widths and <16mm widths (differentiating those that had attained MLS from those that had not). Each group was then weighed using electronic scales accurate to 0.01g.

The data was entered into Excel spreadsheets and transferred to MapInfo v12.0 GIS software. Interpolated density models were drawn around the data points, creating separate layers for the following cockle densities:

- 10 – 99 cockles/m^2
- 100 – 499 cockles/m^2
- 500 – 999 cockles/m^2
- 1,000+ cockles/m^2

For the 10 – 99 density layer, the borders of the polygon extended halfway between stations supporting cockles and those that didn't. For the subsequent layers, consideration was given to the neighbouring stations when considering how far borders extended. Two separate layers were drawn to show the extent of ≥16mm cockles and the extent of <16mm cockles.

The 10 – 99 cockles/m^2 density layers were used to estimate the area of cockle coverage in each bed. Structured Query Language (SQL) tools in MapInfo were used to determine the mean numbers of cockles present at each station and their mean biomass. The biomass of each group in each bed was determined by multiplying their mean biomass by the bed area.

The size frequency of cockle widths were recorded in Excel and displayed as histograms.

Results

Tables 1 to 3 show the stock summaries for the three beds surveyed on July 30th 2015, while figures 5 and 6 show the distributions of cockles ≥16mm width and <16mm width. Because the sampled cockles were predominantly from the 2013 year-class cohort, with few representatives from the 2014 or 2015 settlements, the results have only been displayed as two size-groups.

Table 1 - Summary of the cockle stocks at the Horseshoe Point bed in July 2015

Cockle Width (mm)	Bed Area (ha)	Mean Density (cockles m^{-2})	Mean Weight (t/ha^{-1})	Stock biomass (t)
≥16mm	24.9	127.9	7.82	195
<16mm	16.9	72.5	2.14	36

Table 2 - Summary of the cockle stocks at the West Grainthorpe Haven bed in July 2015

Cockle Width (mm)	Bed Area (ha)	Mean Density (cockles m^{-2})	Mean Weight (t/ha^{-1})	Stock biomass (t)
≥16mm	5.4	70.0	3.61	19
<16mm	5.4	125.0	3.58	19

Table 3 - Summary of the cockle stocks at the East Grainthorpe Haven bed in July 2015

Cockle Width (mm)	Bed Area (ha)	Mean Density (cockles m^{-2})	Mean Weight (t/ha^{-1})	Stock biomass (t)
≥16mm	12.9	152.3	8.25	107
<16mm	12.6	310.0	8.67	109

From these tables and charts it can be seen that cockle beds at the larger Horseshoe Point site are more extensive than either of the two smaller Grainthorpe sites. The average cockle densities are similar between the Horseshoe Point and West Grainthorpe site, though, but a higher proportion of those at the Horseshoe Point size have reached 16mm width. This can also be seen in figures 7 and 8, which show the cockle size frequencies for each of these beds. By comparison, the East Grainthorpe bed supports approximately double the cockle densities found on the other two beds but a lower proportion of these have attained 16mm width than on the Horseshoe Point bed. In terms of weight, the East Grainthorpe bed supports the highest mean weight of cockles, but as only half of the biomass is composed of cockles that have attained MLS, those at Horseshoe Point represent a more suitable fishery.

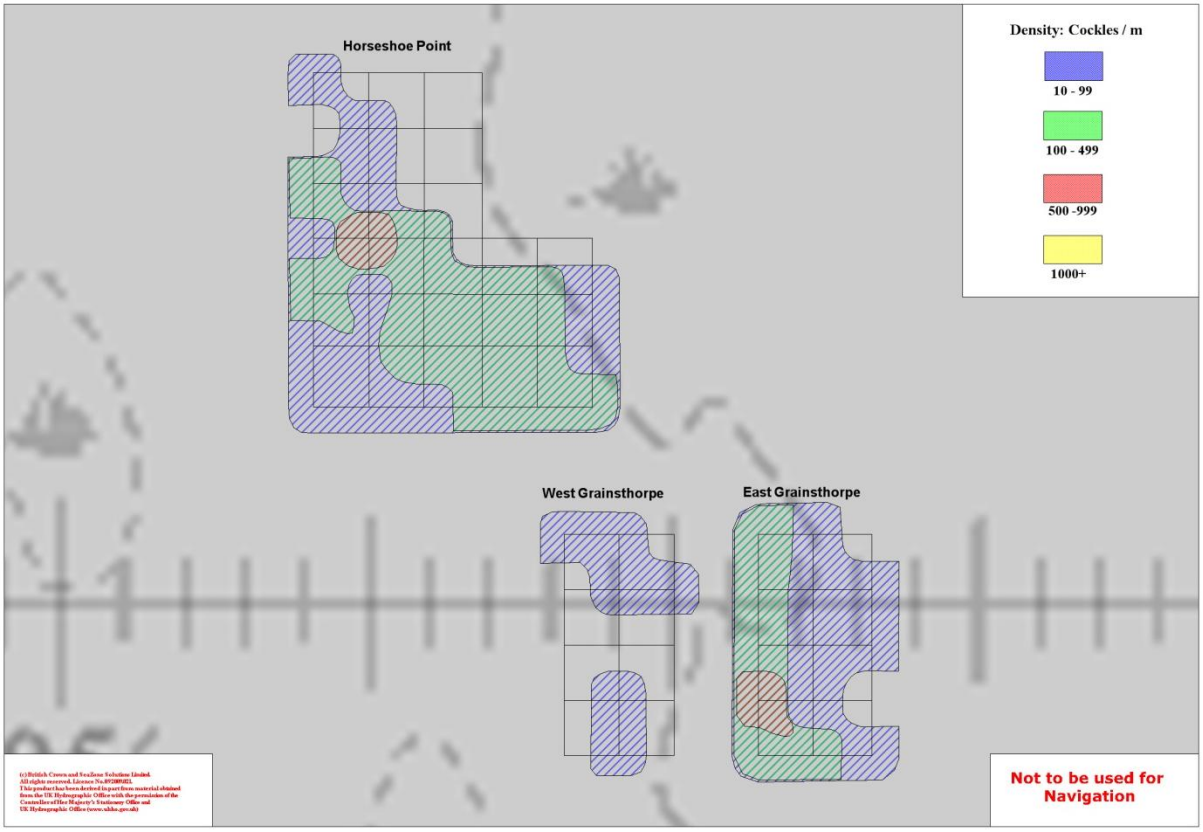

Figure 5 – Distribution of cockles ≥16mm width. July 2015

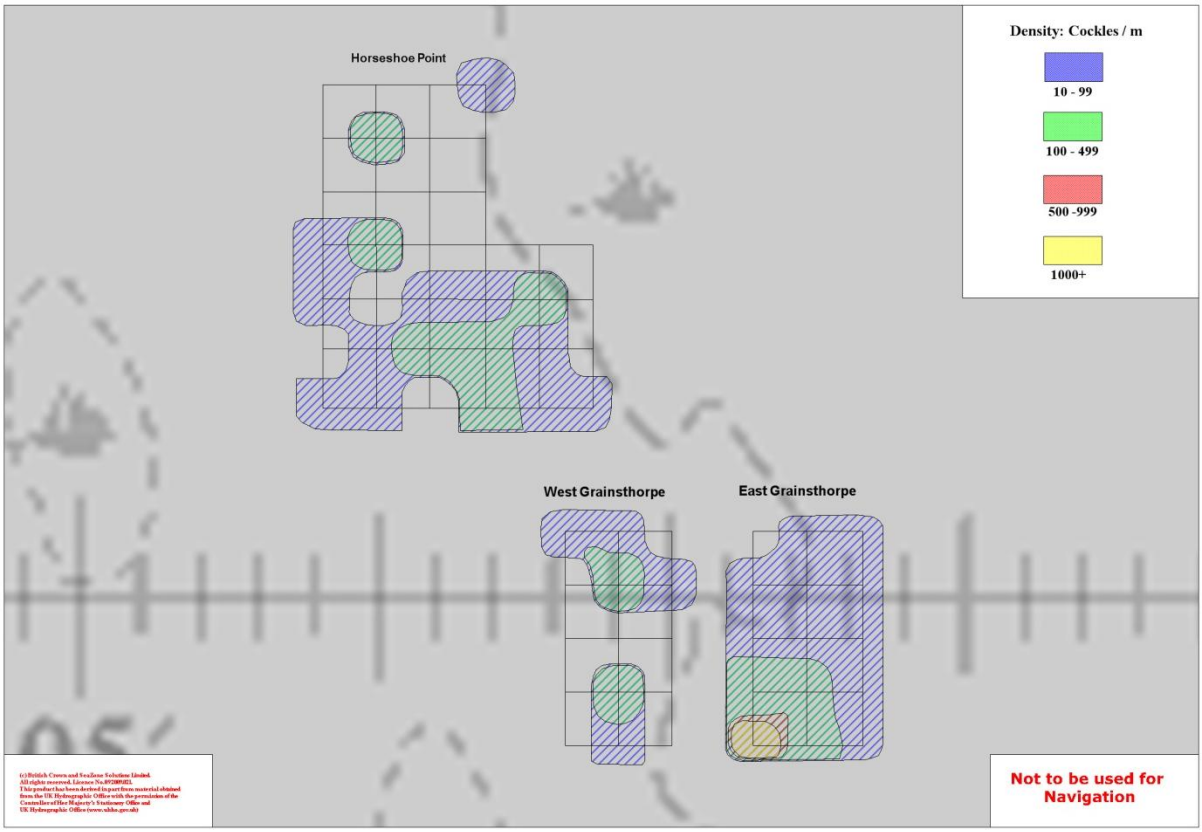

Figure 6 – Distribution of cockles <14mm width. July 2015

Figures 7 to 9 show the size frequency of the cockles sampled at the three beds in August 2014 and July 2015. At all three beds each year's dataset shows a unimodal distribution, with good growth having occurred during the year. The majority of the cockles in both years' datasets are from the 2013 year-class cohort. During both surveys, the cockles at the Horseshoe Point site were of a higher average size than those from the Grainthorpe beds, while those from the East Grainthorp bed were the smallest.

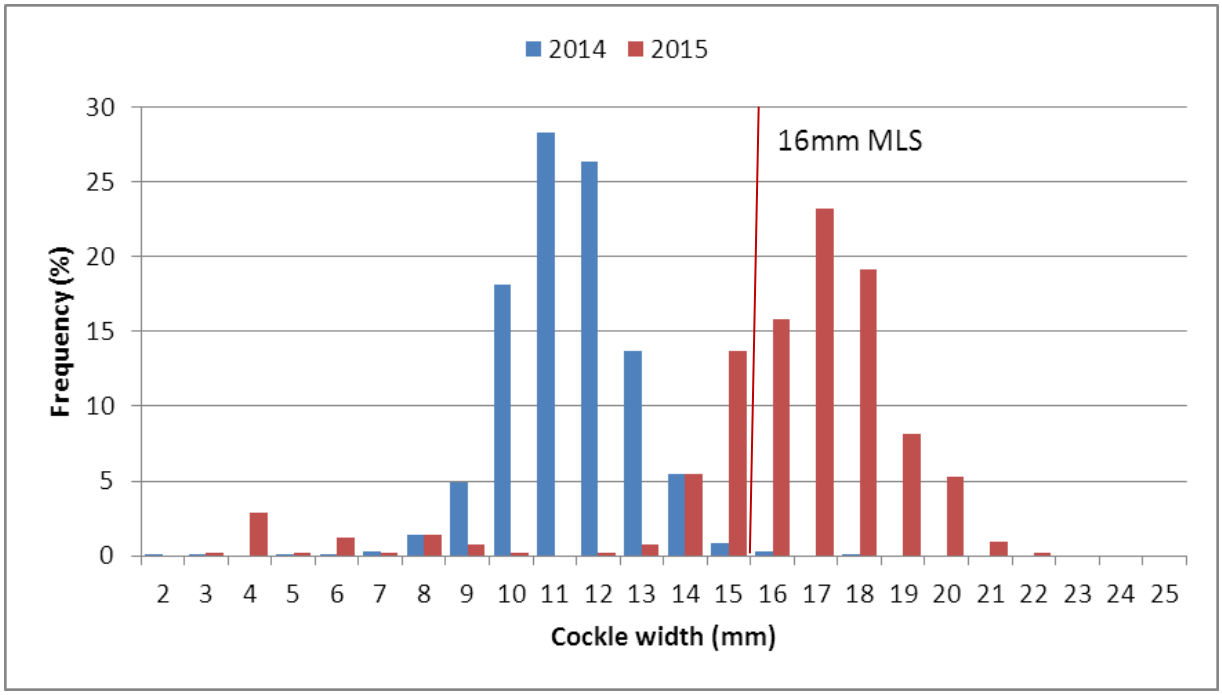

Figure 7 – Size frequency of cockles at the Horseshoe Point bed. August 2014 and July 2015

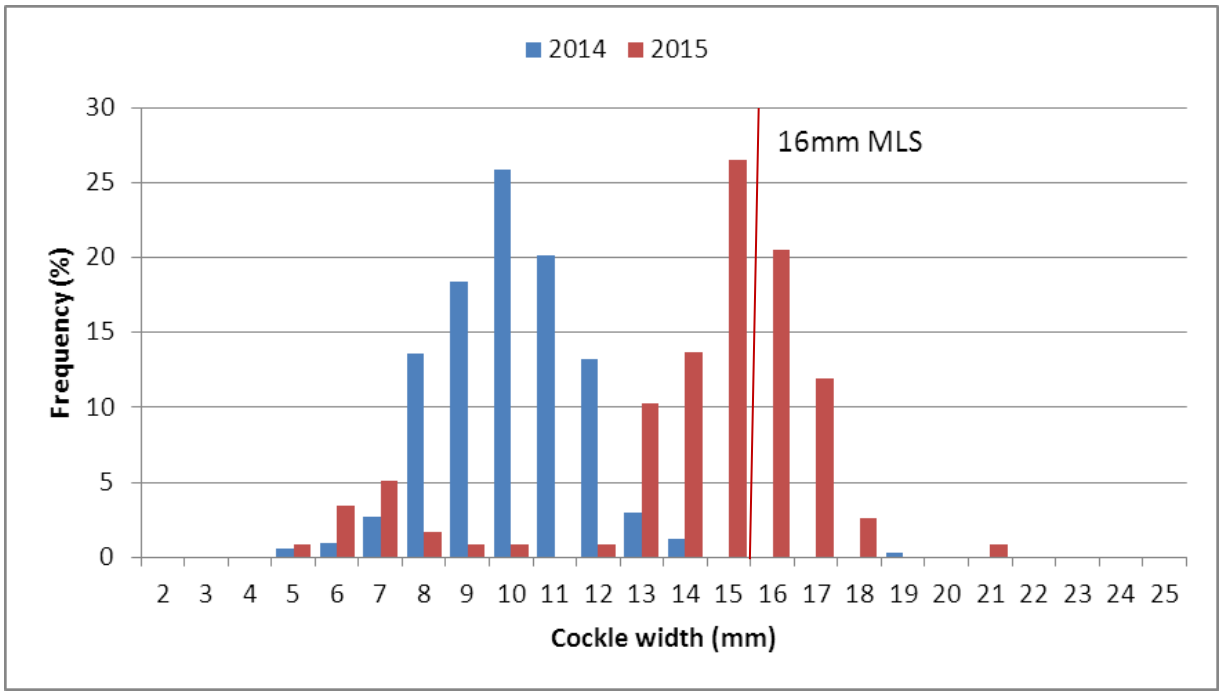

Figure 8 – Size frequency of cockles at the West Grainthorpe bed. August 2014 and July 2015

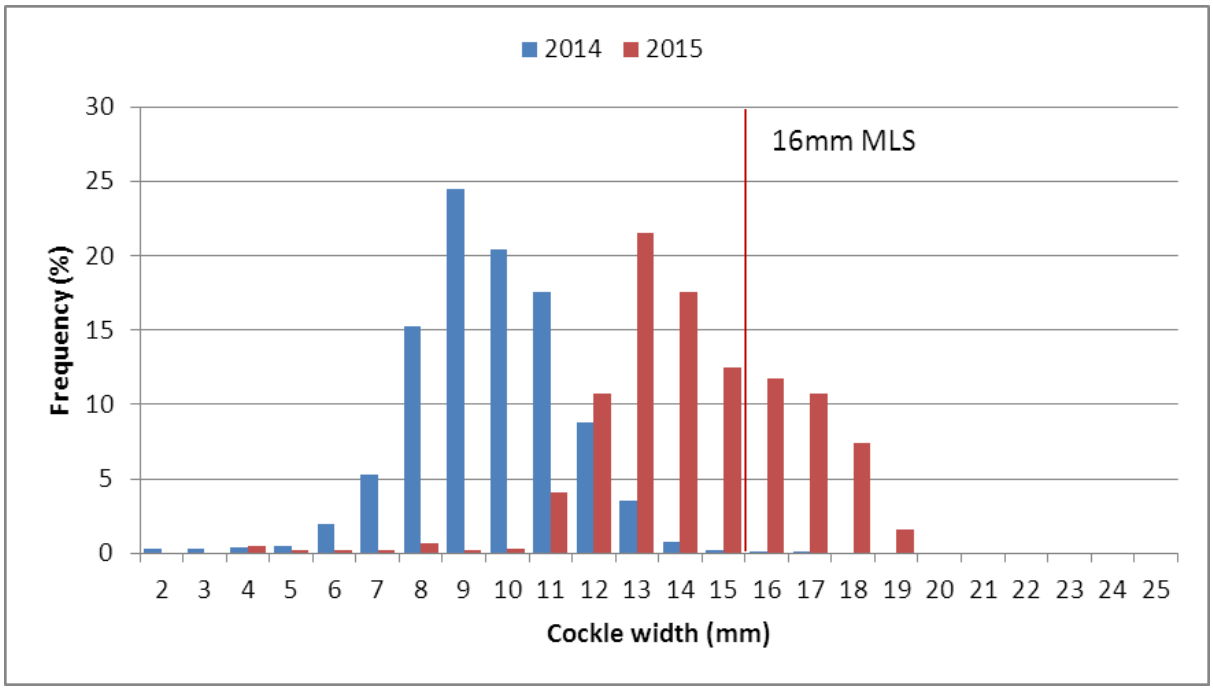

Figure 9 – Size frequency of cockles at the East Grainthorpe bed. August 2014 and July 2015

Discussion

Surveys conducted by EIFCA since 2011 have found the cockle beds at Horseshoe Point have had successful recruitments in 2010, 2011, 2012 and 2013. Of these, however, only the 2013 cohort survived beyond the following summer. Die-offs, characterised by gaping, moribund cockles laying on the surface during warm summer months, are similar to those that have been regularly occurring in the Wash since 2008. There the cause is possibly due to haplosporidian parasites that were identified in samples analysed by Cefas. Although the 2013 cohort survived the summer in 2014, the recent survey found them to be dying now. This raises the question of why this cohort survived longer than the three preceding ones?

Although haplosporidian parasites are suspected to be the cause of the regular mortalities that occur in the Wash, this has not been proven. Since 2008, however, trends have been highlighted that cockle size rather than age is a factor in their demise, as is warm summer temperatures. Survey results also show that successful settlements of spat have occurred more regularly in the Wash since 2008 than before. Because cockles expend large amounts of energy during spawning, it is possible these factors are linked – either because the parasites are more able to infect weakened cockles that have just spawned, or the additional stress of spawning is too much for already infected cockles to survive. Cockles do not tend to spawn until they have attained a size of about 12mm width, so this could explain why atypical mortality mainly seems to affect larger cockles, the summer heat being an additional stress. Survey results show that on average cockles grow faster at Horseshoe Point than in the Wash. The 2011-2013 Horseshoe Point surveys have shown that the cockles there have been reaching maturity, spawning and dying within their first year. The 2014 survey found that the 2013 cohort had grown slightly slower than the previous cohorts and had not spawned. If size and spawning are factors in atypical mortality, this would explain why this cohort had survived an additional year but was now dying. The stock summaries shown in table 4 also support this idea. This table, which shows the level of stock on the three beds in August 2014 and July 2015 shows that while all three beds have declined during the previous year, this rate has been faster at the Horseshoe Point bed where growth has also been the fastest.

Table 4 – Total cockle stocks found at the Horseshoe Point beds in 2014 and 2015 and their percentage decline

Bed	Total stock (t) 2014	Total Stock (t) 2015	Percentage decline
Horseshoe Point	562	158	59%
Grainthorpe West	60	9	37%
Grainthorpe East	316	54	32%
Total	938	485	48%

Because the cockles on these beds have recently suffered such short life-spans, there haven't been any opportunities for a fishery until this year. Unfortunately, due to several issues relating to accessing the site, opening these beds has proved difficult. It seems unlikely that the difficulties encountered this year will be satisfactorily resolved before the stocks die. If survival of these cockles to harvestable size relies on specific conditions, such as cool springs preventing spawning in their first year, future fishing opportunities will be limited and likely to have short windows. It is important, therefore, to ensure the access issues encountered this year are resolved, irrespective of whether the stocks survive. Failure to do so will result in future opportunities also being lost.

At the time of the July survey few 2015 cockles were found, suggesting there had only been a poor settlement this year. If this is so, and the 2013 cohort dies, there will be limited opportunities for a fishery in the coming two years. Temperatures were slow to warm up during 2015, however, so it is possible that spawning was delayed and settlement has not yet occurred.

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